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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

[X] Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 160.00

Complete if Known	
Application Number	08/835,419
Filing Date	04/09/1997
First Named Inventor	Arthur M. Fraas
Examiner Name	A. Doroshenk
Art Unit	1764
Attorney Docket No.	

METHOD OF PAYMENT *(check all that apply)*

[X] Check [ ] Credit card [ ] Money Order [ ] Other [ ] None

[ ] Deposit Account:

Deposit Account Number

Deposit Account Name

The Commissioner is authorized to: *(check all that apply)*

[ ] Charge fee(s) indicated below [ ] Credit any overpayments

[ ] Charge any additional fee(s) during the pendency of this application

[ ] Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims		-20** =		X =
Independent Claims		- 3** =		X =
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	160
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 160.00

SUBMITTED BY

Name (Print/Type)	James C. Wray	Registration No. (Attorney/Agent)	22,693	Telephone	(703) 442-4800
Signature				Date	08/18/2003

(Complete *if applicable*)

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

FRAAS et al.

Serial No. 08/835,419 **Art Unit: 1764**

Filed: April 9, 1997 **Examiner: A. Doroshenk**

For: PRETREATMENT PROCESS TO REMOVE OXYGEN FROM COAL EN ROUTE TO A COAL PYROLYSIS PROCESS AS A MEANS OF IMPROVING THE QUALITY OF THE HYDROCARBON LIQUID PRODUCT

APPEAL BRIEF

To the Commissioner of Patents and Trademarks

Sir:

REAL PARTY IN INTEREST

Arthur P. Fraas is the real party in interest in the above identified application by virtue of an Assignment dated April 4, 1997, recorded on Reel 8498, Frame 0989.

RELATED APPEALS AND INTERFERENCES

No other related appeals or interferences are pending.

STATUS OF CLAIMS

Claims 1-4, 6-14, and 16-23 were finally rejected over prior patents. Claims 5 and 15 have been cancelled.

A copy of the appealed claims is appended hereto in the Appendix.

STATUS OF AMENDMENTS

No claim amendments were proposed after the final rejection.

SUMMARY OF THE INVENTION

The present invention relates to a pyrolysis system for power plants with a fluidized bed combustor (Figures 1-12, specification pages 8-24). Figure 1 shows a representative coal converter and combustor system 1 in which the vibrated bed pyrolysis system 3 is coupled to an atmospheric fluidized bed coal combustion furnace 5, commonly referred to as an AFBC. The fluidized bed 7 in this type of furnace usually consists mostly of limestone 9 or dolomite that calcines on heating to form CaO, a sorbent that gives good retention of the SO_2 formed from the sulfur in the coal as it is burned at a temperature in the 1500 to 1650°F range. Thus the bulk of the solid particles 11 in the bed are CaO coated with a hard layer of $CaSO_4$ (specification page 8, lines 17-25).

Crushed coal 13 is fed from a supply hopper 15 through a screw feeder 17 to a vibrating bed coal deoxygenator 19 mounted next to the vibrating bed pyrolysis retort 21. The two vibrating beds are mounted on a vibrating machine 23. The deoxygenator preheats the coal to around 400°F to drive off the superficial moisture before the coal enters the pyrolysis bed, which will commonly operate in the temperature range of about 1000°F to 1250°F for the best yield of products (depending on the coal used) (specification page 9, lines 2-10).

The pretreatment bed serves to remove the oxygen, moisture and the majority of the fine particles from the coal before it reaches the pyrolysis bed. The oxygen, moisture and coal fines are flowed to the combustor 5 through pipe 25 for burning the fines. The crushed coal particles and the hot solid particles from the combustor flow to the pyrolizer 21 as shown by line 26 (specification page 9, lines 11-16).

The point at which the sorbent stream 27 is tapped 28 from the combustor is chosen to minimize the amount of fines, and the high combustion air flow 29 through the fluidized bed in the furnace will naturally carry off practically all of the smaller particles as they are generated by attrition in the AFBC. Thus the amount of fine particles available for elutriation from the pyrolysis bed is minimized. Deoxygenator 19 in the system preheats the coal, increases the heating rate of the particles as they enter the pyrolysis bed, and reduces moisture contamination of the product liquid (specification page 9, lines 17-25).

To minimize the time that the product vapor is exposed to high temperature, a jet condenser 31 enclosed within a thermally-insulated sleeve 33 is mounted in the freeboard 35 above the pyrolysis bed 37 to quench the hydrocarbon vapor product with a recirculated stream of the product liquid that has been cooled to just above the boiling point of water; operating the condenser 31 in this temperature range minimizes the amount of moisture in the hydrocarbon condensate 41. The spray of droplets provides a large surface area in a compact condenser whose effectiveness

will not be degraded by the formation of tarry deposits on heat transfer surfaces. The liquid and gaseous pyrolysis products 41 leaving the jet condenser drain down to a header tank 43 having sufficient volume so that the liquid collects in the lower part of the tank while the uncondensable vapors and gases 45 leave at the top and flow to the AFBC furnace along with the water vapor 25 leaving the dryer (specification page 10, lines 3-18).

The quench liquid 39 is pumped to the jet condenser 31 by the pump 47 through the cooler 49, where it is cooled by flowing ambient water 51 in and hot water 53 out (specification page 10, lines 19-21).

The stream 55 of char and sorbent leaving the pyrolysis bed is returned to the AFBC furnace by a gas lift 57 driven by a blower 59. The power required to drive the vibrating machine 23 and the gas lift blower 55 is about 0.1% of the net plant electrical output. That compares with about 0.6% for the power required for the coal pulverizers in a conventional pulverized coal-fired steam power plant (specification page 10, lines 22-26).

The flow 27 of hot sorbent from the AFBC to the vibrating beds is controlled by L-valves 61 and 63 that also serve as flow meters. Product liquid 65 drains out through an overflow port 67 in the header tank 43 into the storage tank 69 (specification page 11, lines 3-7).

Figure 2 shows another representative coal pyrolysis system that employs ceramic balls as the process heating medium rather

than the hot lime-ash material from a fluidized bed combustor as in the process of Fig. 1. In the process of Fig. 2 the raw crushed and screened coal flows from the coal hopper 1 to the pretreatment vessel 2 en route to the pyrolysis retort 3. A mixture of char from the coal and ceramic balls flows out of the retort 3 to a screen 4 in which the char particles, which are relatively small, fall through the screen and flow into the steam boiler furnace 5 where the char is burned to fuel the boiler (specification page 11, lines 17-26).

The ceramic balls are sufficiently larger than the crushed coal so that they are skimmed off by the screen 4 and are conveyed upward via an air lift 6 to a ball heater 7. A portion of the heated balls flows out of the heater 7 to the pretreatment vessel 2 to heat the raw coal to around 400°F, while the balance of the heated balls flows to the pyrolysis retort 3 to provide the heat required for the pyrolysis process which operates at a temperature of around 1050°F (specification page 12, lines 1-8).

The vapors and gases driven out of the coal in the pyrolysis process flow upward to a condenser 8. The condensate drains down to a liquid storage tank 9 while the non-condensable gases flow upward to the ball heater 7 where they are burned with air in a mixture less than stoichiometric so that the oxygen concentration in the gases leaving the ball heater is less than 50 ppm. A portion of this gas flows to the pretreatment vessel 2 as a sweep gas to carry off the oxygen evolved in the pretreatment process. After picking up oxygen from the coal, that gas with its

increased oxygen content is returned to the ball heater 7 where the oxygen is consumed by combustion of the pyrolysis gases (specification page 12, lines 8-19).

The release of CO as a function of heating time in a nitrogen atmosphere with a CO meter yielded test curves for the CO concentration in the exhaust gas as a function of time such as those in Figs. 4 and 5 for the pretreatment and pyrolysis processes respectively. These curves show high CO release rates in sporadic bursts that occurred during slow heating at particular temperatures of about 121, 177, 232, 288, and 510°C (250, 350, 450, 550 and 950°F). The high releases found at low temperatures are remarkably different from the complete absence of CO releases up to a temperature of 450°C, or 850°F, shown in Figure 6, which is typical of those in the literature (specification page 15, lines 2-13).

Oxygen concentration and coal temperature were observed as a function of time (Figure 7). While the amount of oxygen evolved is much less than the amount of CO, it is still substantial; oxygen is released even at room temperature when the coal is treated with a sweep gas having an oxygen concentration below 50 ppm so that the oxygen partial pressure is of the order of 50 μm of Hg. When the coal is heated, as in the cases for which the CO release rate was measured, bursts of oxygen release occur at about 121, 177, and 204°C (250, 350, and 400°F) (specification page 15, lines 18-26).

A key element in the inventors' development of this new pretreatment concept is the discovery that there appear to be two distinctly different contaminants that are responsible for the production of the heavy black tars that have plagued all previous coal pyrolysis systems. The first contaminant is in the form of fine particles of char (a specie of activated carbon) that act as catalysts to polymerize unsaturated liquid hydrocarbons at a relatively slow rate over a period of days or weeks at room temperature. The second contaminant is free oxygen which at pyrolysis process temperatures forms active ions that trigger rapid polymerization reactions that take place in times of the order of a second (specification page 16, lines 15-26).

Thus the first step in avoiding heavy tar formation is the use of a vibration-fluidized bed to reduce the solid particle content of the pyrolysis vapor by a factor of at least 10,000 over that for gas-fluidized beds. This is a necessary but not sufficient condition; it is also essential that the oxygen concentration in the pyrolysis retort be kept to extremely low levels. To accomplish this the oxygen content of the sweep gas must be kept below about 50 ppm, and the adsorbed or loosely bound oxygen in the coal fed to the process must be largely removed by a pretreatment process as described in this patent application (specification page 17, lines 1-10).

ISSUES

Whether the Examiner's action in reopening prosecution is in error (37 C.F.R. § 1.198)?

Whether claims 1-4, 6, 9, 11-14, 16, 19, 22, and 23 are patentable under 35 U.S.C. 103(a) over Selep (US Patent 4,397,657) in view of Dospoy (US Patent 5,743,924)?

Whether claims 7 and 17 are patentable under 35 U.S.C. 103(a) over Selep (US Patent 4,397,657) in view of Potter (US Patent 6,112,675)?

Whether claims 8 and 18 are patentable under 35 U.S.C. 103(a) over Selep (US Patent 4,397,657) in view of Bridle (US Patent 4,781,796)?

Whether claims 10, 20, and 21 are patentable under 35 U.S.C. 103(a) over Selep (US Patent 4,397,657) in view of Piotter (4,931,171)?

GROUPING OF CLAIMS

The claims do not stand or fall together.

ARGUMENTS

The Examiner's action in reopening prosecution is in error. 37 C.F.R. § 1.198.

The Examiner's action in reopening prosecution is in error, particularly when the Board reversed the rejection of some of the claims and Applicant merely placed those claims in condition for allowance. The Examiner states in the Advisory Action (paper no. 21) that the rejection of the claims over the Selep reference

conforms with the Board of Patent Appeals and Interferences (Board) Decision and "the primary basis of the rejections made is with reference and deference to ... the Board ..." The Examiner's selective deference to the Board is in error. The Examiner defies the Board as to claims that the Board indicated to be allowable but defers to the Board on the Selep reference.

Applicant timely filed a Response following the Board Decision on Rehearing. That Response simply placed this case in condition for allowance by rewriting allowable claims in independent form and rewriting the claims, allowable by virtue of the reversal by the Board, to place the allowable claims in condition for allowance. Applicant's amendment did not raise any new issues, did not re-open prosection and did not go beyond the scope of 37 C.F.R. § 1.198 and MPEP § 1214.07.

The Examiner's action in reopening prosecution is in error.

See 37 C.F.R. § 1.198:

> **Cases which have been decided by the Board of Patent Appeals and Interferences will not be reopened or reconsidered by the primary examiner except under the provisions of §1.114 or § 1.196 without the written authority of the commissioner, and then only for the consideration of matters not already adjudicated, sufficient cause being shown.** (emphasis supplied)

The Examiner's action of arbitrarily re-opening prosecution, without sufficient cause being shown, defies the mandate of the code.

See also MPEP § 1214.07 which states that only new claims that do not conform with the Board decision should be filed with an RCE (which would have re-opened prosecution). However,

Applicant simply placed the allowable claims in condition for allowance and cancelled the appealed claims. The Examiner has in essence arbitrarily and capriciously taken the Application back to 1997 (original Filing) on the same grounds and issues "already adjudicated" and decided by the Board.

MPEP § 1214.07 further expressly provides:

> **"If the amendment obviously places an application in condition for allowance, ... the primary examiner should recommend that the amendment be admitted, ... and the amendment will be entered. ...**
> **In the event that claims stand allowed in the application ... the application should pass to issue."** (emphasis supplied).

Applicant respectfully requests the Board to allow this case to issue.

The present claims are patentable under 35 U.S.C. 103(a):

In considering the patentability of the present invention, it is requested that the Board consider the invention as a whole, consider the scope and content of the prior art as a whole, consider the differences between the claims at issue and the prior art, and consider the level of ordinary skill in the art to which the invention pertains at the time the invention was made. **Graham v. John Deere Co., 148 USPQ 459, 467 (1966).**

THE INVENTION AS A WHOLE

The invention considered as a whole is best described by the appended claims.

PRIOR ART AS A WHOLE

The prior art to which the invention pertains is typified by the references of record.

DIFFERENCES BETWEEN THE INVENTION AND THE PRIOR ART

Each of the present claims defines unique features and each is individually patentable over the prior art.

The test in reviewing rejections under 35 U.S.C. 103 in which the examiner has relied on teachings of several references, is whether references, viewed individually and collectively, would have suggested claimed invention to a person possessing ordinary skill in the art, and citing references which merely indicate that isolated elements and/or features recited in the claims are known is not a sufficient basis for concluding that combination of the claimed elements would have been obvious. **Ex parte Hiyamizu, 10 USPQ2d 1393-1395 (Board of Patent Appeals and Inter., 1988); In re Kaslow, 217 USPQ 1089 (Fed. Cir. 1983); In re Deminski, 230 USPQ 313 (Fed. Cir. 1986).**

Claims 1-4, 6, 9, 11-14, 16, 19, 22 and 23 are patentable under 35 U.S.C. 103(a) over Selep (4,397,657) and Dospoy (5,743,924).

Each of the present claims describes unique features and each is individually patentable over Selep.

In the present invention, coal is supplied to a preheater. The unique pretreatment of the invention serves to remove oxygen, moisture and the majority of the fine particles inherent in the

coal before it reaches the gasification stage. Selep does not teach or suggest pretreatment.

That [the prior art] might incorporate elements which could be used in appellants' system does not render appellants' claims obvious when there is no suggestion of using these elements in substantially the same manner as appellants use them. **In re Donovan, 184 USPQ 414, 421 (CCPA, 1975).**

A sweep gas is used to carry off the released oxygen, moisture and fines prior to moving the coal to the pyrolysis stage. The unique prior removal of oxygen from the coal, that would otherwise have been produced in and hindered the pyrolysis stage, results in the production of a liquid hydrocarbon with a much lower viscosity. Nothing in Selep describes, teaches, or suggests those claimed features. Thus, the reference cannot render obvious any claim.

In **In re Gordon, 221 USPQ, 1127,** the court pointed out, "the mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification". **In re Fritch, 23 USPQ2d 1783, 1784 (CAFC, August 1992).**

It has been widely recognized that it is desirable to exclude air from pyrolysis processes. However, none of the prior art patents recognizes the problem (as uniquely done in the present application) that oxygen can be given off from the coal itself in the course of the pyrolysis process, and that this

oxygen can badly degrade the quality of the liquid hydrocarbons produced, apparently inducing them to polymerize into a viscous black tar.

While those patents include mention of the use of a cover-gas, or buffer-gas, such as nitrogen or combustion products as a means for keeping air out of the system, the prime objective of each of the patents of record is to provide a means for raising the pressure of the gas-borne coal particles to the high pressure required for the coal conversion process.

Selep has no apparatus for preheating coal, nor an apparatus for removing oxygen from the coal. Selep describes passing coal through two rotary gas locks prior to gasification. Nitrogen is supplied to the inlet of the first rotary gas lock to prevent "oxygen-containing ambient air from entering first rotary lock" (col. 5, lines 14-15). After the nitrogen purge, the transferring compartments of the second rotary gas lock are swept with product gas to exhaust "buffer gas from said material transferring compartments" (column 7, lines 11-12).

For a long time coal pyrolysis has been aggravated by the presence of oxygen in the retort. Solutions were attempted to try to remove the oxygen from atmospheric gases surrounding the coal before it was retorted. The trick of the invention is to recognize that oxygen which produces the problem is embedded in the coal itself (please see the specification page 5, lines 4-7). The solution which the invention proposed is to preheat the coal in a vibrated vessel to below the pyrolysis temperature to drive

off oxygen from within the coal itself (see specification page 5, lines 11-14). The invention discovers and solves the problem. The oxygen bound in the coal itself produces the problem of heavy viscous black tar (page 2, line 6).

Each of the references of record neither recognizes the problem nor suggests a solution. Selep, for example, thinks the problem is atmospheric oxygen and uses two sequential gas locks to solve what he believes the problem to be.

Nothing inherent in Dospoy and Selep would have suggested their mutual combination in a manner proposed by the examiner.

Dospoy feeds coal from a bunker 10 to a hammer mill 15 to a surge pin and weigh feeder 22, from whence it is mixed with kraft cores from storage bunker 30 LDPE plastic and paper sludge, and dust from a cooler dust cyclone 46. The mixed product is flowed through a conditioning tank and metering screws into mill extruders, which make pellets which are dried <u>in ambient air</u> and then transferred to a pellet bunker. There is absolutely nothing in Selep's gas lock system for charging a pressurized gasification reactor that has anything at all to do with the Dospoy system. In fact, the two would lead away from each other.

Claims 1-4, 6, 9, 11-14, 16, 19, 22 and 23 specifically point out features of the invention not found in either Selep or Dospoy. Neither Selep nor Dospoy have a pretreatment vessel for holding a bed of coal. Neither Selep nor Dospoy has a preheater for heating the bed of coal to a temperature below coal pyrolysis temperature. Neither Selep nor Dospoy has an enclosure around a

vessel for preventing air from contacting the bed of coal particles. Neither Selep nor Dospoy has an oxygen remover for removing oxygen released from the heated coal particles, and transporting oxygen away from the enclosure so that the partial pressure of oxygen in the pretreatment region is kept low. Neither Dospoy nor Selep has a vibrating machine connected to a pretreatment vessel with a preheater. Neither Dospoy nor Selep has the vibrating machine for vibrating a vessel. Neither Selep nor Dospoy has a vibrating machine for providing rapid mixing and heating of coal particles entering the bed of coal particles. Neither Dospoy nor Selep has a vibrating machine connected to a vessel for vibrating the vessel and providing rapid mixing and heating of coal particles entering the bed in the vessel for providing uniform removal of oxygen from coal particles.

Each of the above features is positively set forth in claim 1. None of the above features is found in either reference.

Claim 2 adds, but neither of the references has, an inlet for feeding coal particles to such a pretreatment vessel as described in claim 1, or an outlet for removing particles from such a vessel as described in claim 1. Claim 2 would not have been obvious from Dospoy and Selep.

Claim 3 specifically points out a pyrolysis retort near the pretreatment vessel as described in claim 1 and transfer passages for transferring heated coal particles from the pretreatment vessel to the pyrolysis retort. Claim 3 could not have been obvious from the two references.

Claim 4 further describes providing a pretreatment vessel which serves as a dryer for removing moisture from the coal. That is not present in either Dospoy or Selep. Selep does not have a pretreatment vessel and does not remove moisture from the coal, and to the contrary, adds moisture to the system in the form of steam through blade-stripping port 64. Dospoy has none of those things. The combination of Selep and Dospoy would not have been obvious, and such a combination would not have rendered the invention obvious.

Claim 6 adds to claim 1 a gas input connected to the vessel as described in claim 1 for contacting the coal particles in the bed within the vessel. In the references there is no outlet for a sweep gas connected to a vessel as specifically pointed out in claim 1. There is no inlet and outlet to the vessel as particularly pointed out in claim 1 in either reference. There is no extraction of oxygen from the coal particles themselves in a vessel, as specifically pointed out in claim 6, in either reference.

Claim 9 adds to claim 6 a source for supplying carbon monoxide to the coal particles and removing oxygen from the coal particles with the carbon monoxide, which is absent in the references.

Claim 11 particularly points out a coal pyrolysis pretreatment which heats a bed of coal particles. There is nothing in the references which shows coal pyrolysis pretreatment with heating of a bed of coal particles. Selep is completely

silent about heating and never uses the word heating or pretreating. Selep strips coal that may be clinging to the blades 35 (column 4, line 25, column 5, line 68) "with stripping gas such as steam". Selep never mentions that steam is used to preheat coal. The tiny amount of steam used for stripping blades could not and would not preheat coal. Indeed, the steam is admitted through port 64, which is at a point where the blades 35 and compartments 38 are free of coal (Figure 1) and exhausts from those compartments through port 56. Pretreating by heating in a vessel is totally missing in Selep and is imaginative and figmentary and not well based on fact, and indeed is contrary to the facts specifically set forth in Selep.

Dospoy does not have a pretreatment vessel for holding a bed of coal particles. Indeed, Dospoy would lead away from pretreating the coal particles in a vessel holding a bed of coal particles. Dospoy would have led away from pretreating and preheating the coal particles. Nothing in either reference would have suggested removing oxygen released from heated coal particles, as specifically set forth in claim 11, and nothing would have suggested removing oxygen released from heated coal particles from the enclosure before subjecting the coal to pyrolysis. Nothing in either reference would have suggested vibrating the vessel and providing rapid mixing and heating of coal particles entering the bed from an input to provide uniform removal of oxygen from the coal particles, as specifically set forth in claim 11. Claim 11 would not have been obvious from a

combination of the references, because none of the features in claim 11 is found in either reference.

Claims 12 through 14 individually add other features to claim 11, none of which would have been obvious from the references.

Claim 12 would not have been obvious from the references, because claim 12 specifically points out inputting coal particles to the pretreatment vessel, as described in claim 11, and removing particles from that pretreatment vessel, as described in claim 11. Nothing in the references would suggest those steps.

Claim 13 adds to claim 11 the transferring of heated coal particles from the vessel to the pyrolysis retort near the vessel. None of those features would have been obvious from the references.

Claim 14 specifically points out removing moisture from the coal. Neither reference specifically points out removing moisture from the coal. Indeed, Selep adds moisture to the system in the form of steam.

Claim 16 further adds to claim 11 the contacting of coal particles in the bed with an oxygen removal gas, and removing the oxygen removal gas with the oxygen removed from the coal particles. There in nothing in the references which suggests either of those steps. Selep does not have coal particles in a bed, and does not talk about removing oxygen from the coal particles and does not even mention removing oxygen from the coal

particles. Dospoy never discusses and leads away from removing oxygen from coal particles in a bed.

Claim 19 adds to claim 16 supplying carbon monoxide to the bed of coal particles and removing oxygen from the coal particles with the carbon monoxide, which is not taught or suggested by the references.

Claim 22 adds to claim 11 the further holding of the bed of coal particles in the pretreatment vessel and transporting oxygen released from the heated coal particles away from the enclosure for keeping the partial pressure of oxygen in the pretreatment region low. Neither reference has any of those features. Selep leads away from holding a bed of coal particles, and both Selep and Dospoy lead away from the pretreatment vessel holding coal particles and transporting oxygen away from heated coal particles. Selep leads away from heating coal particles because Selep never mentions heating. Selep never recognizes the problem that the present invention solves.

Claim 23 adds to claim 11 transferring the pretreated coal particles to a pyrolysis retort. There is no pretreating of coal particles in Selep, which simply describes gas locks and nothing more. No transferring of pretreated coal particles to a pyrolysis retort is in either reference.

None of the claims would have been obvious from a combination of Selep and Dospoy. Nothing inherent in Selep and Dospoy would have suggested or motivated their combination.

The examiner has used the applicant's claims to pick unrelated bits and pieces from the prior art which have no autogenous motivation or suggestion for combination.

The Board, in **Ex parte Levengood, 28 USPQ2d 1300, 1301 (Board of App. and Inter. 1993)**, observed:

> "The only suggestion for the examiner's combination of the isolated teachings of the applied references improperly stems from appellant's disclosure and not from the applied prior art. **In re Ehrreich, 200 USPQ 504 (CCPA 1979)**. At best, the examiner's comments regarding obviousness amount to an assertion that one of ordinary skill in the art would have been able to arrive at the appellant's invention because he had the necessary skills to carry out the requisite... steps. This is an inappropriate standard for obviousness."

The above is true for the present case. Thus, the Examiner has not met the burden of proving obviousness, and therefore, there is no prima facie case of obviousness with respect to any of the claims.

The prime objective of the prior patents is the drying of the coal before feeding it to the main process. There is no mention of removal of loosely-bound oxygen from the coal, or its deleterious effects on the product liquid.

In **In re Fine, 5 USPQ2d 1596, 1599 (Fed. Cir 1988)**, the Court observed:

> "Because [the reference does not] suggest the claimed invention, the Board erred in affirming the Examiner's conclusion that it would have been obvious to substitute the [secondary reference features] in the [primary system]. The [references] disclose, at most, that one skilled in the art might find it obvious to try the claimed invention. But whether a particular combination might be 'obvious to try' is not a legitimate test of patentability. **In re Geiger, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); In re Goodwin, 198 USPQ 1, 3 (CCPA 1978).**

Claims 7 and 17 are patentable under 35 U.S.C. 103(a) over Selep (4,397,657) and Potter (6,112, 675).

Claim 7 has several features which are not found in Selep or Potter.

The pretreatment vessel for holding a bed of coal particles is not found in Selep or Potter. The preheater for heating the bed of coal particles is not found in Selep or Potter. The enclosure around a vessel which holds and preheats coal particles is not found in either reference. An oxygen remover for removing oxygen release from heated coal particles is not found in either reference. Selep simply traps gas and does not heat particles or remove oxygen released from heated coal particles. Potter does not have oxygen removed from heated coal particles. Potter simply feeds contaminated materials such as soils to a rotary calciner. Potter does not deal with coal and has no relation to coal, and has no heater for removing oxygen from coal. Nothing in Potter and Selep would have suggested their combination. Nothing in either reference suggests an oxygen remover for removing oxygen released from heated coal particles, as specifically pointed out in claim 7.

Claim 17 adds to claim 16 and claim 11 moving oxygen from coal particles and removing that oxygen from the heated bed of coal particles, and supplying low oxygen flue gas to a bed of coal. None of those features would have been obvious from either of the Selep or Potter references.

Selep and Potter cannot be combined. Potter's purpose is to decontaminate inert materials such as soil, sludge, biological

and other waste materials contaminated with chemical compounds (column 1, line 20). Potter's purpose also is to treat hazardous and non hazardous components from manufacturing processes. Although Potter's drawings are complex, it is clear that he simply feeds materials from a live bottom hopper through a weigh belt and screw feeder directly into a rotary calciner with natural gas fired burners. There is absolutely nothing in Potter or in Selep that would have suggested their mutual combination.

Lacking any teaching within the references, it is not understood how one of ordinary skill could arrive at the present invention. Of course, like the Examiner, the ordinary skilled artisan could use the present invention as a guide for hindsight reconstruction. However, that cannot substantiate any obviousness rejection.

"It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." **In re Fritch, 23 USPQ2d 1783, 1784 (CAFC, August 1992)**, quoting from **In re Gorman, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991)**. "This court has previously stated that one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." **Id.** quoting from **In re Fine, 5 USPQ2d 1600 (CAFC, 1988)**.

Claims 8 and 18 are patentable under 35 U.S.C. 103(a) over Selep (4,397,657) and Bridle (4,781,796).

Bridle and Selep cannot combined.

Claims 8 and 18 distinguish the invention from the Selep and Bridle references by specifically pointing out the pretreatment vessel for holding a bed of coal, which neither reference has. The preheater for heating the bed of coal to temperature below coal pyrolysis and an oxygen remover for removing oxygen released from the heated coal particles are not found in Selep or Potter. None of those features would have been obvious from either reference.

Claim 8 further points out collecting non condensable combustible gases from coal pyrolysis, and burning the non condensable combustible gases for supplying hot partially combusted non condensable gases from the burner to the bed of coal particles to serve as a sweep gas for heating and removing oxygen from the bed of coal particles. None of those features is described in either the Selep or Bridle references. Neither has a bed of coal particles, and neither heats a bed of coal particles. Neither reference removes oxygen from coal particles.

Nothing in Selep or Bridle would have suggested or motivated their mutual combination.

Claim 18 distinguishes the invention from Potter and Selep by pointing out the coal pyrolysis pretreatment process, comprising heating a bed of coal particles to a temperature below coal pyrolysis temperature range, which would not have been obvious from either reference, preventing air from contacting the bed of coal particles, which would not have been obvious, and removing oxygen released from the heated coal particles, which

would not have obvious from either reference, before subjecting the coal to pyrolysis, which would not have been obvious from either reference.

Claim 18 further points out collecting non condensable combustible gases from coal pyrolysis and burning the collected non condensable combustible gases for heating the bed of coal, which would not have been obvious from either reference. Claim 18 further points out supplying partially combusted collected non condensable gases from the burner to the bed of coal particles for removing oxygen from the bed of coal particles. No part of those steps would have been obvious from either reference or from the combination of references. Nothing inherent in Bridle and Selep would have motivated their combination.

"The inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown. **In re Spormann and Heinke, 150 USPQ 449, 452 (CCPA 1966).** "... if the Patent Office wishes to rely on what 'Those familiar with [invention] would know,' it must produce some reference showing what such knowledge consists of." **Id.**

There is absolutely nothing in Bridle and Selep which would have suggested their mutual combination. Bridle transfers sludge from a hopper 36 to several screw conveyors 40, 44, 16 to a reaction zone with blades 50, which lift the sludge upward and drop it. Finally, the sludge is collected in a sealed char

storage bin 64. Nothing in any of those features would have inherently suggested combining Bridle with Selep.

"The mere fact that a certain thing may result from a given set of circumstances is not sufficient [to establish inherency]." **In re Rijckaert, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993)**, quoting from **In re Oelrich, 212 USPQ 323, 326 (CCPA 1981)**. "Such a retrospective view of inherency is not a substitute for some teaching or suggestion supporting an obviousness rejection." **Rijckaert, id.,** quoting from **In re Newell, 13 USPQ2d 1248, 1250 (Fed. Cir. 1989)**.

Claims 10, 20 and 21 are patentable under 35 U.S.C. 103(a) over Selep (4,397,657) and Piotter (4,931,171).

Selep and Piotter cannot be combined. Selep and Piotter have absolutely nothing inherent within the references which would have motivated their mutual combination in a manner proposed by the examiner.

Piotter has a large vertical retort in which shale is dropped and in which char is combusted. The effluent from combuster 36 is passed to retort 12 through line 42 and lines 30, 32 and 34.

There is absolutely nothing in the Selep reference which would have suggested the combination of Selep with Piotter, and there is absolutely nothing in the Piotter reference which would have suggested combination with Selep.

Nothing inherent in Selep and Piotter would have motivated their combination. Even if the references would have been

combined, nothing in the references would have suggested a coal pyrolysis pretreatment vessel for holding a bed of coal particles, as specifically pointed out in claim 10. Nothing would have suggested a preheater for heating a bed of coal particles, as pointed out in claim 10. Nothing would have suggested heating a bed of coal particles to below coal pyrolysis temperature, as pointed out in claim 10. And nothing in the references would have suggested an enclosure around the vessel for preventing air from contacting the bed of coal particles, as pointed out in claim 10. Nothing would have suggested an oxygen remover for removing oxygen released from the heated coal particles, as pointed out in claim 10, because nothing would have suggested removing oxygen from heated coal particles in either reference.

Nothing would have suggested that the preheater is a furnace holding ceramic balls a size larger than the coal particles in the bed. That would have required a figmentary leap of imagination. Nothing in the references would have suggested circulating ceramic balls from the furnace to the bed of coal particles, as specifically pointed out in claim 10, and nothing would have suggested heating coal particles in a pretreatment vessel and recycling the balls through the furnace for reheating, as specifically pointed out in claim 10. Nothing in the two references would have suggested those particular features as pointed out in the process steps of claim 20. Specifically, none would have suggested heating a bed of coal particles to a

temperature below a coal pyrolysis temperature, and none of the references would have suggested removing oxygen released from the heated coal particles from the enclosure before subjecting the coal to pyrolysis. Neither reference would have suggested the heating in a furnace of ceramic balls of a size larger than coal particles in the bed, and nothing in the references would have suggested circulating heated ceramic balls from the furnace to the bed of coal particles for heating coal particles in a vessel and recycling the balls through the furnace, as specifically pointed out in claim 20.

The basis for the rejection of claim 21, previously indicated as allowable, has not been specifically pointed out by the examiner, and it is difficult, if not impossible, to predict how the examiner would have possibly considered the subject matter of that claim to have been rendered obvious by the references.

"Particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed." In re Kotzab, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

Throughout the rejections the examiner has discussed references without discussing what part of the references is applied, and has discussed claims generally without pointing out what elements or features are believed to correspond between the claims and the prior art.

The Federal Circuit has held that the Patent Office is obligated to make necessary findings and to provide an administrative record showing the evidence on which the findings are based, accompanied by the agency's reasoning in reaching its conclusion. In re Zurko, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001). The decision "must be justified within the four corners of the record." In re Gartside, 53 USPQ2d 1769, 1774 (Fed. Cir. 2000). The examiner has neither made the necessary findings nor provided any reasoning for the arbitrary conclusion of obviousness based on an admission that the references do not teach the claimed features.

The examiner cannot sit mum, leaving the applicant to shoot arrows into the dark hoping to somehow hit a secret objection harbored by the examiner. The 'prima facie case' notion ... was intended to leave no doubt among examiners that they must state clearly and specifically any objections (the prima facie case) to patentability, and give the applicant fair opportunity to meet those objections ... the concept serves to level the playing field and reduces the likelihood of administrative arbitrariness (emphasis added). In re Oetiker, 25 USPQ2d 1443, 1447 (Fed. Cir. 1992) (Plager, J., concurring); see In re Piasecki, 233, USPQ 785, 788 (Fed. Cir. 1984).

In all of the combinations of prior art references, the examiner has simply picked features from the references using the claims of the invention as a guide. That picking and choosing

features from references using the invention as a road map has long been proscribed by statute, rule and law.

The examiner has not applied the Graham v. John Deere test to any of the new §103 rejections.

None of the prior art references should have been combined because there is no motivation within the references which would have suggested their combination. Nor is there anything inherent in the references which would have suggested their combination in the manner proposed by the examiner.

Even if the references were to have been combined, they would not have met the limitations of the claims.

The long-standing problem that the loosely-bonded oxygen in coal can severely degrade the quality of the liquid product from a pyrolysis process is not even recognized in the art and, therefore, its solution is non-existent and cannot be anticipated nor rendered obvious by the prior art.

That the long-standing problem identified above has dogged the industry remains a fact, because its seriousness is apparent from the fact that every pilot plant in the U.S. that has been designed to produce motor fuel from coal has failed to yield a liquid of an acceptable quality.

"Where the invention for which a patent is sought solves a problem which persisted in the art, we must look to the problem as well as to its solution if we are to properly appraise what was done and to evaluate it against what would be obvious to one

having the ordinary skills of the art." **In re Rothermal, 125 USPQ 328, 332 (CCPA, 1960).**

The present application is for a coal pretreatment process that is effective in removing the loosely-bonded oxygen from the coal, thus making it possible to employ a coal pyrolysis process and obtain a good quality low viscosity fuel oil with an optimum high energy efficiency at a moderate cost.

Nothing in the prior art teaches or suggests the claimed features. Thus, the present claims cannot be anticipated nor rendered obvious over any reference.

In deciding that a[n invention] would have been obvious, there must be supporting teaching in the prior art. There is no suggestion or motivation in the prior art to combine the elements as done by the present invention and hence the claims cannot be rendered obvious. **In re Newell, 13 USPQ2d 1248, 1250 (CAFC, 1989).**

LEVEL OF ORDINARY SKILL IN THE ART

A person having ordinary skill in the art is an artisan being taught the reference teachings.

SUMMARY

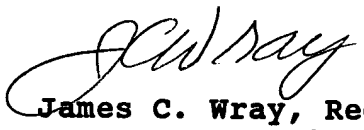
When considering the present invention as a whole and the prior art to which the invention pertains as a whole, when considering the differences between the present invention and the prior art, and when considering the level of ordinary skill in

the art to which the invention pertains, it is clear that the invention would not have been obvious to a person having ordinary skill in the art at the time the invention was made.

CONCLUSION

Reversal of the Examiner and allowance of all the claims are respectfully requested.

Respectfully,



James C. Wray, Reg. No. 22,693
Meera P. Narasimhan, Reg.No. 40,252
1493 Chain Bridge Road, Suite 300
McLean, Virginia 22101
Tel: (703) 442-4800
Fax: (703) 448-7397

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APPENDIX

Appealed Claims:

1. A coal pyrolysis pretreatment apparatus comprising a pretreatment vessel for holding a bed of coal particles, a preheater for heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, an enclosure around the vessel for preventing air from contacting the bed of coal particles, an oxygen remover for removing the oxygen released from the heated coal particles and transporting it away from the enclosure so that the partial pressure of oxygen in the pretreatment region is kept low, and a vibrating machine connected to the vessel for vibrating the vessel and providing rapid mixing and heating of coal particles entering the bed from the input to provide uniform removal of oxygen from coal particles.

2. The apparatus of claim 1, further comprising an inlet for feeding coal particles to the vessel and an outlet for removing particles from the vessel.

3. The apparatus of claim 1, further comprising a pyrolysis retort near the vessel and transfer passages for transferring heated coal particles from the pretreatment vessel to the pyrolysis retort while preventing entry of air.

4. The apparatus of claim 1, wherein the pretreatment vessel further serves as a dryer for removing moisture from the coal.

6. The apparatus of claim 1, further comprising a gas input connected to the vessel for contacting the coal particles in the bed with a sweep gas of low oxygen content, and a gas outlet connected to the enclosure for removing the sweep gas before the oxygen extracted from the coal particles builds up in the sweep gas and inhibits the deoxidation process.

7. A coal pyrolysis pretreatment apparatus comprising a pretreatment vessel for holding a bed of coal particles, a preheater for heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, an enclosure around the vessel for preventing air from contacting the bed of coal particles, an oxygen remover for removing the oxygen released from the heated coal particles and transporting it away from the enclosure so that the partial pressure of oxygen in the pretreatment region is kept low, and a flue gas source connected to a gas input for supplying low oxygen concentration flue gas as an oxygen removal sweep gas to the bed of coal.

8. A coal pyrolysis pretreatment apparatus comprising a pretreatment vessel for holding a bed of coal particles, a preheater for heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, an enclosure around the vessel for preventing air from contacting the bed of coal particles, an oxygen remover for removing the oxygen released from the heated coal particles and transporting it away from the enclosure so that the partial pressure of oxygen in the pretreatment region is kept low, further comprising a collector

for collecting non-condensable combustible gases from coal pyrolysis, and a burner for partially burning the collected non-condensable combustible gases and supplying hot, partially combusted non-condensable gases from the burner to the bed of coal particles to serve as a sweep gas for heating and removing oxygen from the bed of coal particles.

9. The apparatus of claim 6, further comprising a source of carbon monoxide connected to the gas input for supplying carbon monoxide to the bed of coal particles and removing oxygen from the coal particles with the carbon monoxide.

10. A coal pyrolysis pretreatment apparatus comprising a pretreatment vessel for holding a bed of coal particles, a preheater for heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, an enclosure around the vessel for preventing air from contacting the bed of coal particles, an oxygen remover for removing the oxygen released from the heated coal particles and transporting it away from the enclosure so that the partial pressure of oxygen in the pretreatment region is kept low, wherein the preheater comprises a furnace holding ceramic balls of a size larger than coal particles in the bed, and provisions for circulating the ceramic balls from the furnace to the bed of coal particles for heating the coal particles in the pretreatment vessel and recycling the balls through the furnace for reheating.

11. A coal pyrolysis pretreatment process comprising heating a bed of coal particles in a vessel to a temperature

below the coal pyrolysis temperature range, preventing air from contacting the bed of coal particles, and removing oxygen released from the heated coal particles from the enclosure before subjecting the coal to pyrolysis vibrating the vessel and providing rapid mixing and heating of coal particles entering the bed from an input to provide uniform removal of oxygen from coal particles.

12. The process of claim 11, further comprising inputting coal particles to a pretreatment vessel and removing particles from the vessel.

13. The process of claim 11, further comprising transferring heated coal particles from the vessel to a pyrolysis retort near the vessel while preventing entry of air.

14. The apparatus of claim 11, further comprising removing moisture from the coal.

16. The apparatus of claim 11, further comprising contacting the coal particles in the bed with an oxygen removal gas, and removing the oxygen removal gas with the oxygen removed from the coal particles.

17. A coal pyrolysis pretreatment process comprising heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, preventing air from contacting the bed of coal particles, and removing oxygen released from the heated coal particles from the enclosure before subjecting the coal to pyrolysis, supplying low oxygen flue gas as oxygen removal gas to the bed of coal.

18. A coal pyrolysis pretreatment process comprising heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, preventing air from contacting the bed of coal particles, and removing oxygen released from the heated coal particles from the enclosure before subjecting the coal to pyrolysis, collecting non-condensable combustible gases from coal pyrolysis, and burning the collected non-condensable combustible gases for heating the bed of coal, and supplying partially combusted collected non-condensable gases from the burner to the bed of coal particles for removing oxygen from the bed of coal particles.

19. The process of claim 16, further comprising supplying carbon monoxide to the bed of coal particles and removing oxygen from the coal particles with the carbon monoxide.

20. A coal pyrolysis pretreatment process comprising heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, preventing air from contacting the bed of coal particles, and removing oxygen released from the heated coal particles from the enclosure before subjecting the coal to pyrolysis, wherein the heating comprises heating in a furnace ceramic balls of a size larger than coal particles in the bed, and circulating the heated ceramic balls from the furnace to the bed of coal particles for heating the coal particles in the vessel and recycling the balls through the furnace.

21. The process of claim 20, further comprising circulating some of the ceramic balls to the vessel for pretreating the coal

by preheating the coal and removing oxygen, flowing coal from the pretreatment vessel to a pyrolysis retort and circulating some of the ceramic balls to the pyrolysis retort for pyrolysis of the coal.

22. The process of coal pyrolysis pretreatment of claim 11, further comprising providing a pretreatment vessel for holding the bed of coal particles, heating the bed of coal particles to a temperature below the coal pyrolysis temperature range in a preheater, preventing air from contacting the bed of coal particles in an enclosure around the vessel, and transporting the oxygen released from the heated coal particles away from the enclosure for keeping the partial pressure of oxygen in the pretreatment region low.

23. The coal pyrolysis pretreatment process of claim 11, further comprising transferring the pretreated coal to a pyrolysis retort in the absence of air.